National Climate Assessment Development and Advisory Committee
EPA Potomac Yard Conference Center
2777 S. Crystal Drive
Arlington, VA 22202
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Tuesday, August 16, 2011

Welcome
Jerry Melillo, Marine Biological Laboratory and NCADAC Chair

Dr. Jerry Melillo welcomed the participants and introduced Dr. John Holdren.

Opening Remarks
John Holdren, Assistant to the President for Science and Technology, and Director of the White House Office of Science and Technology Policy (OSTP)

Summary

Dr. Holdren said that the National Climate Assessment (NCA) is important to both himself and to President Obama. He noted the President's interest in our current state of knowledge regarding impacts of climate change, as well as his interest in adaptation and mitigation activities to address climate change. Noting the observed increases in extreme events, Dr. Holdren made the point that climate scientists are no longer alone in their awareness or in their concern regarding climate change. He noted the importance of having properly analyzed data and information available that will enable the Nation to move forward with adaptation/mitigation efforts when it is ready. Further, he charged the National Climate Assessment Development and Advisory Committee (NCADAC) with the responsibility of distilling and providing that information in a way that enables decision makers to make better decisions and to cut across regional and sectoral boundaries. He set the stage for a recurring theme of this meeting – the NCADAC should focus keenly on establishing a long-term, sustainable process for conducting assessments and not just on the short-term product.

Dr. Holdren then outlined the many milestones achieved by the NCADAC to date. He also commended the NCADAC for its innovation regarding the open process they have developed for receiving technical input from the public. Also noted was USGCRP's commitment to developing an information portal that will provide a high level of transparency regarding sources of information (data, *etc*.) and allow more accessibility to both the product and the process. In conclusion, Dr. Holdren mentioned some of the many challenges faced by the NCADAC as well as everyone involved – including stakeholder engagement, communication, transparency, and overall coordination.

Discussion
NCADAC members asked Dr. Holdren to discuss his sense of the public's and the business community's perceptions regarding climate change. He reported that public awareness and concern remains high, though support did diminish following the issues raised over "Climate-Gate" (the emails from the climate research group at the University of East Anglia in the UK). Many corporations agree that climate change is of real concern and are making investments in resilience, but believe solutions will come more readily once companies figure out how to profit monetarily from their investments. He cautioned that we must get better at explaining that environmental processes are no less important to our well being than are economic processes.

Introductions, Opening Remarks, Approval of Agenda
Jerry Melillo, Marine Biological Laboratory, NCADAC Chair

Members who were not present at previous NCADAC meetings were asked to introduce themselves. Dr. Melillo then highlighted the two parallel processes that this NCADAC must address: the long-term process and the shorter-term product. He stressed that the 2013 product is not the end of the NCA activity, and that it should not serve as a distraction from the long-term process. He emphasized in particular the high cost associated with stopping and starting the NCA process every time a product is due.

The floor was opened for comments on the agenda. Some confusion was expressed regarding the multiple sign-up times for public comment with only one time slot on the agenda for actual comments. After discussion, the decision was made to maintain only one public comment period as was advertised in the *Federal Register* notice.

Action: The NCADAC members approved the agenda as presented.

Approval of Minutes from Previous NCADAC Meetings
T.C. Richmond, GordonDerr, LLC, NCADAC Vice-Chair

It was agreed that the general format of the minutes will include identification of the topic, a general summary of any discussion, and identification of actions taken. The minutes from the April 4-6, 2011 meeting were approved with no modification. Minutes from the May 20, 2011 meeting were approved pending clarification on the topic of biogeographical *versus* geopolitical regions. The importance of the impacts of climate change on high altitude regions was noted as an example; these are not defined by state boundaries but do need to be evaluated as part of the assessment in a comprehensive way. The minutes will be modified to reflect that the discussion at the May meeting was broader than to just provide a few examples and to reflect the need to identify specific examples for the 2013 report. It will also be noted that the examples discussed were not exhaustive and will continue to be expanded in the future.

Action: The NCADAC approved the minutes from the April 2011 meeting with no modifications. The NCADAC approved the minutes from the May 2011 meeting pending the clarification of biogeographical regions *versus* geopolitical regions.

Initial Comments from NCADAC Designated Federal Official
Cynthia Decker, NOAA and NCADAC Designated Federal Official

Dr. Decker reminded everyone that only NCADAC members are allowed to engage in discussions. Dr. Melillo also noted that he would like for the NCA Director, Kathy Jacobs, and the Executive Director of the US Global Change Research Program (USGCRP), Tom Armstrong, to be allowed to participate in discussions freely; there was no opposition to his request.

Overview of the NCA and NCADAC Progress Update
Kathy Jacobs, White House Office of Science and Technology Policy, NCA Director

Summary (see powerpoint)
Ms. Jacobs provided an update of the current status of the assessment and its multiple components and activities. An Executive Secretariat consisting of 13 members was selected by Dr. Jane Lubchenco, Under Secretary of Commerce, to manage the affairs of the NCADAC. Jacobs provided a brief description for each of the following Working Groups established by the Executive Secretariat:

- Scenarios and regional summaries – develop consistent scenarios for assessing climate change and provide climatological summaries and projections for each of the NCA regions
- Request for information – gather and organize expressions of interest and technical input reports to the NCA from the public
- Peer review, information standards, and access – develop and maintain high standards for peer review (meeting the requirements of the Information Quality Act), process documentation, information access and transparency
- Engagement, communication, and evaluation – address communications issues and build stakeholder and scientific engagement in the assessment process, establish metrics of success
- Regional coordination – establish coordination across regional assessment teams to ensure comparable outcomes
- Sectoral coordination – establish clear expectations and guidance for the 13 sectoral assessments
- Science of climate change – provide updates to climate science, with focus on extremes
- Agenda for climate change science – will identify what the NCA feeds back into the federal research prioritization process

- Adaptation and mitigation – will examine progress in societal responses to climate change
- Indicators development and evaluation – develop a set of national indicators of impacts and vulnerability for the NCA, evaluate rate of change and responses to change
- International – will develop the international component/context for NCA
- Long term process – the need for this group has been identified though chairs but members have yet to be determined

Ms. Jacobs shared the NCA goal and vision statements and summarized the components and approach described in the adopted Strategic Plan.

The outline for the 2013 report parallels many of the Working Group topics. The plan for addressing regions and sectors is to start with the 2009 NCA (*Global Climate Change Impacts in the United States*) as a first draft and focus on providing new, updated information. Ms. Jacobs stressed that the NCA will update as much information as possible in the given time frame, and that other topics will continue to be addressed beyond the 2013 report as part of the continuing NCA process.

Ms. Jacobs concluded by highlighting some major milestones achieved for the NCA: regional and sectoral teams established, potential biogeographical topics identified, request for information issued, scenario development and regional summaries underway, global change information portal in development, and a preliminary plan for engagement and communications has been developed. Outcomes identified for the NCA include ongoing and relevant analysis, access to NCA-related data, systematic evaluation of progress towards risk reduction, sustained process for informing an integrated research program, evaluation of adaptation/mitigation policy options, and information providing a foundation for a science-based national discourse on climate change.

Discussion

Discussion focused around the need to include the Mississippi River basin as a biogeographical cross-cutting topic. There was general agreement that the Mississippi River basin should be included and that this could be done in a variety of ways (*e.g.*, as components or text boxes within the Great Plains region or Gulf Coast case study). It was also generally agreed that the NCA should do its best to address critical intersections amongst regions, sectors, and issues, and that those high priority items that cannot be covered in the 2013 product, can and will be covered in subsequent products as part of the ongoing NCA. The point was also made that the report should include an explanation of how/why given boundaries were drawn, whether regional, biophysical, or otherwise.

NCA Structure and Information Flow

Jerry Melillo, Marine Biological Laboratory and NCADAC Chair

Summary (see powerpoint)
Dr. Melillo discussed the NCA structure within the federal government and the U.S. Global Change Research Program (USGCRP), NCADAC, and networks of partners and stakeholders. Under the NCADAC, there is the Executive Secretariat, Working Groups, various technical input teams, and chapter author teams. The distinction between technical input teams and chapter authors of the NCA reports is an important one. The chapter authors will use the technical inputs as well as other sources of information (*e.g.*, existing literature) to produce draft chapters for the 2013 report. The final report will be a product of the NCADAC.

Working groups (WGs) can be formed either by the NCADAC at a NCADAC meeting or by the Executive Secretariat following a one-week notice and request for volunteers and comments from NCADAC members. Working Group chairs can be appointed by the Executive Secretariat and Working Group members are appointed by the NCADAC chair and vice-chairs. Nominations for Working Group members can come from any source.

Technical input teams may be formed by the Working Groups or may form on their own independent of the NCADAC groups. For teams formed by Working Groups, leaders for these teams are confirmed by the Executive Secretariat in consultation with Working Group chairs, and nominations for team members can come from any source.

Discussion
There was general confusion regarding the difference between technical input teams and chapter author teams. Dr. Melillo clarified that the technical input teams will provide information that *can* be used by chapter author teams; there is no guarantee that technical input provided by the teams *will* be used by chapter authors or included in the final product. A mechanism for deciding which inputs are included and which are not has yet to be determined, but it is the responsibility of the chapter author team to make this decision based on guidance from the peer review and data management workgroup. . It is possible that some of the Working Group technical inputs might form the core material for the chapters on the same topic. There were several suggestions to change the PowerPoint slide by drawing a connection between Working Groups and chapter author teams, and from Working Groups to the NCADAC, rather than just to the Executive Secretariat.

Chapter author teams have not yet been identified, and there was a general consensus that they should be identified soon and that a date/timeline for choosing them should be decided upon. It was also stated that the process for selecting chapter author teams must be highly transparent. A suggestion was made that relevant and justifiable expertise must be a top criterion.

Concern was expressed regarding the review process for technical inputs to the NCA. Technical inputs will not have to undergo formal agency review or external peer review prior to being considered by an author team. While the NCA will be considered a *Highly Influential Scientific Assessment* and will be held to corresponding standards of quality review and transparency as

defined in the Information Quality Act (IQA), technical inputs themselves are not subject to the IQA guidelines. However, technical input teams should keep the end-product in mind and be aware that traceability and quality review will be a factor for the NCA report itself.

Confusion was expressed regarding the RFI/EOI (request for information/expression of interest) submission process. It was clarified that submitting materials via the RFI/EOI process is intended to allow the NCADAC to have an official process for documenting and distributing the information that is submitted for consideration by chapter author teams. Groups are not required to have an EOI on file in order to submit materials, but material submitted outside of this process cannot be guaranteed for consideration by the NCADAC. Existing materials can be submitted directly to Emily Cloyd at USGCRP.

Action: The NCADAC approved the overall NCA structural concept with the caveat that information be shown to flow from chapter author teams to Working Groups (for clarification or further information) and from Working Groups to the NCADAC.

Action: Overall approval of the NCA process with the following caveats:

- Clarify that technical inputs are not being filtered or reviewed, just documented and forwarded through the NCADAC to the appropriate chapter author teams.
- Clarify whether technical inputs can be considered if submitted after the current March 1, 2012 deadline. Discussion focused on inclusion of new sources particularly in response to comments.

Expectations for 2013 Report

Jerry Melillo, Marine Biological Laboratory and NCADAC Chair

Summary (see draft outline)

The draft outline for the 2013 report was presented for discussion. The 2013 product will focus primarily on new information (since the 2009 report). Most projections will come from CMIP3, since CMIP5 results will not be ready in time for this report. The NCADAC would like to find a way to incorporate CMIP5 findings in the 2013 report to the extent possible, at least with points of comparison, with the understanding that these results will be discussed in greater detail in forthcoming NCA products. Though other biogeographical regions are yet to be chosen, chapters on Oceans and Coastal Zones will definitely be included. The Agenda for Climate Science chapter will try to build in both natural/physical and social science perspectives. It is possible that the outline will be expanded to include a chapter on international aspects of the NCA.

Discussion

It was suggested that the current outline overlooks large segments of the business sector (e.g., information technology sector) and that disaster risk reduction should be addressed throughout

the NCA. It was also noted that an appropriate place in the outline for the climate change indicators section should be ensured.

Timeline and Milestones
Kathy Jacobs, OSTP, NCA Director
Anne Waple, Program Manager for NOAA's Technical Support Unit to the NCA

Summary (see PowerPoint)
Dr. Waple presented the proposed schedule, including a review of major milestones, with the report production schedule serving as a way to anchor those milestones. The timeline was not intended to capture all of the Working Group activity and did not extend beyond the 2013 report. It includes the review process and ends with the release of the final report in November 2013. The point was made that the timeline is very tight and offers little, if any, room for deviation from the schedule.

The timeline was segregated for purposes of discussion into major sections, including receipt and production of materials, drafting of the report, review process, layout and print, and potential NCADAC meeting dates and purpose of those meetings.

Discussion
Comments focused largely on the lack of flexibility in the proposed timeline. It was also generally agreed that the proposed time for agency review was too short. Since agency review can be rather lengthy, it was suggested that an agency "showstopper" review be held concurrently with the National Research Council (NRC) "showstopper" review in which agencies and the NRC would look for any major issues that would prevent the report from progressing. A couple of suggestions for building a "buffer" into the timeline were to either decrease the scope of the report or to release a web-only version with a reduced print version to follow, thus eliminating the time needed for print-ready layout. The need for clear deadlines for evaluation of progress and points for adaptive decision making was also noted.

Other suggested modifications to the timeline included:
- addition of an orientation meeting for chapter authors early in 2012
- addition of 'delivery of scenario information' as a milestone (as soon as possible)
- coordinate engagement and outreach plans, and start earlier than timeline shows

Action: It was decided that the Executive Secretariat would convene immediately at the conclusion of the first day's NCADAC meeting to discuss whether it makes sense to maintain or reduce the scope of the 2013 report and to edit the timeline accordingly. The modified timeline would be presented for approval at the start of the meeting on the following day.

Risk-based Approach and Uncertainty Lexicon

Gary Yohe, Wesleyan University, NCADAC Vice-Chair

Summary (see PowerPoints)

Dr. Yohe discussed the guidance proposed for incorporating risk management into the NCA. The process, adopted from the Intergovernmental Panel on Climate Change Fourth Assessment Report (IPCC AR4), includes adaptation and mitigation and takes into account climate change damage, co-benefits, sustainability, equity and attitudes to risk. The draft regional strategy for the NCA also calls for the use of a risk-based approach to the extent possible. He suggested that technical inputs should address risk at least for key vulnerabilities in a region or sector. His suggestions for criteria for identifying key vulnerabilities include magnitude, timing, persistence/reversibility, potential for adaptation, distributional aspects, likelihood, and importance. Yohe emphasized that a risk-management perspective looks at a range of possibilities that include opportunities as well as risks.

Dr. Yohe highlighted the need to calibrate consequences and likelihood by providing a "traceable account" to sources used for calibration and the rationale behind qualitative judgments when applied. He also cautioned that likelihood judgments should come from documented sources in a transparent manner. Dr. Yohe pointed out that calibrations of either likelihood or consequence must meet IQA standards, and those that do not, cannot be included in NCA products. He noted that the focus of the NCA will be not only on central tendency, highly likely impacts and vulnerabilities, but also on those with lower likelihood that carry high consequences, such as extreme events. Yohe presented risk matrices as a tool for identifying on which topics researchers should focus their attention. He stressed that these matrices were not intended to be used as decision-making tools, but only to help choose important topics.

Dr. Yohe also offered guidance to the NCADAC for addressing uncertainty based on a presentation developed by Richard Moss. A key motivation is the need for the NCA to inform sound decision making. Acknowledging that uncertainty (or likelihood) qualifiers have different meanings to different people, Yohe suggested that the NCA needs standardized language that will provide consistency in communication of levels of confidence and uncertainty to the users of NCA products. Guidance offered for NCADAC approval included assessing and applying the literature to stakeholder questions, characterizing confidence, and communicating confidence in findings to stakeholders.

Discussion

[Occurred the morning of August 17, 2011]

Concern was expressed regarding potential inconsistencies amongst chapter authors when using subjective calibrations. Dr. Yohe acknowledged this potential issue and explained that traceable accounts would be used as records of how particular conclusions were reached and that chapter authors are ultimately responsible for the science and should hash out their differences during the writing process. He also cautioned that chapter author teams should take care not to overstate confidence levels. A potential solution would be to embed science/risk experts in the chapter author teams to help provide some consistency.

Concern was expressed regarding the proposal for conveying levels of certainty/uncertainty. It was suggested that we adopt the same language as used in the IPCC rather than confuse things by modifying the terminology for the NCA. The point was made that it will be difficult for chapter authors to use a standardized lexicon if the technical input teams are not using the same lexicon.

Several members indicated that they would definitely like to see language on likelihood terminology explicitly included the guidance. Yohe stated that the language was included in a previous version and that this could be reinserted after further conversations with Richard Moss and the NCADAC.

Action: The NCADAC members accepted the general guidance for risk-based framing of the NCA.

Action: The NCADAC members accepted the general guidance for communicating levels of (un)certainty with minor modifications. Gary Yohe and Richard Moss will reconsider inclusion of language on use of likelihood terminology. It is noted that more discussion is needed on the approach to describing likelihood.

Recap of Day 1
Jerry Melillo, Marine Biological Laboratory and NCADAC Chair

Dr. Melillo highlighted some actions and important messages from the day's meeting:

- reconsider approach to the Mississippi River basin
- address potential issues between technical input teams and chapter author teams
- operationalize connections between networks and Working Groups
- develop a deliberate, transparent process for naming chapter authors
- ensure appropriate approach to biophysical regions
- ensure appropriate inclusion of disaster management
- identify an appropriate path forward on an enhanced private sector component
- overall approval of NCA structure and process, but with caveats
- ensure appropriate place in outline for Indicators section
- for the NCA timeline, consider conducting agency review concurrently with NRC review
- add 'delivery of scenario information' to timeline
- coordinate engagement and outreach plans, and start earlier than on timeline
- start chapter author teams earlier than currently planned
- expedite process for adding team members to chapter author groups
- identify clear guidelines for evaluation of progress and points for adaptive decision making
- decide whether or not to "descope" the current outline
- general acceptance for risk-based framing of NCA

- need further discussion and guidance regarding use of terms and communication of (un)certainty

Adjourn
The meeting adjourned for the day at 6:00 pm.

Wednesday, August 17, 2011

Executive Secretariat Discussion of Timeline Modifications (based upon meeting held Tuesday evening)
Jerry Melillo, Marine Biological Laboratory and NCADAC Chair

Summary
Dr. Melillo presented the new proposal developed by the Executive Secretariat (ES) for the production timeline for the 2013 NCA report. They proposed not to alter the current outline of the report, as it was already reduced in scope prior to approval at the May 20, 2011 NCADAC meeting. Instead, they proposed the following alterations to the timeline:

- earlier appointment of chapter authors – appoint convening lead authors by end of September 2011, with full chapter author teams chosen and formalized by mid-November 2011.
- shorten the formal NRC, public, and agency reviews by one month
- extend the agency review from one month to three months

Discussion
The NCADAC members agreed that early selection of chapter authors as described by Dr. Melillo is critical. Concern remained over the review process and timeline. Particular concerns were over the length of time required versus that allotted for public and agency review. It was clarified that agency reviews are more a matter of due diligence and not a review of scientific integrity, which is the responsibility of the NCADAC. Other concerns regarded the political environment surrounding the proposed review and release timeframes.

Action: The NCADAC members agreed to a revised timeline that addressed the concerns expressed above and largely reflected the modified version presented at the meeting.

Agenda for Climate Change Science
Diana Liverman, University of Arizona and Oxford University, NCADAC Member
Tony Janetos, Joint Global Change Research Institute, NCADAC Member

Summary

Dr. Janetos discussed the proposed approach for the Agenda for Climate Change Science section of the NCA report will discuss research needs. A key feature is to consider science needs that are paramount for conducting better assessments. It was suggested that the NCADAC take existing recommendations (from NRC and others) into account.

Dr. Liverman and Dr. Janetos pointed out that the NCA is a use-inspired activity, which means we should set an agenda for research that assesses the utility of the information for applications. Assessing vulnerability, adaptation, and mitigation will require more than increasing scientific understanding. They suggested gathering input from regional and sectoral teams regarding topics they feel are currently hindering their research. They also noted the need to understand the relationship between what is written in this chapter and agencies' plans and aspirations.

Discussion

One comment was to broaden the focus from research that would improve assessments to research that would support adaptation and mitigation, since that is an identified objective in the strategic plan. Another commenter pointed out the need to distinguish between global change and climate change. Janetos clarified that the USGCRP is focused on global change, while the NCA is focused on climate change (in a global change context).

Interaction between technical input teams and chapter author teams was again suggested. It was pointed out that interaction with the full NCADAC needs to happen for this chapter, so that research priorities are not biased by a smaller subset of people.

Mitigation and Adaptation

Rosina Bierbaum, University of Michigan, NCADAC Member
Arthur Lee, Chevron Corporation, NCADAC Member
Joel Smith, Stratus Consulting, NCADAC Member

Summary (see PowerPoint)

Dr. Bierbaum, on behalf of the adaptation and Mitigation Working Group, proposed to focus more on adaptation than mitigation and especially examine the intersection between the two. It was noted that there are other areas of the report where mitigation can be more naturally integrated; the group requested help from others to identify those areas.

They presented a detailed proposal for their chapter outline, which would include an introduction with risk-based framing; adaptation activities, uncertainty, and case studies; interactions between adaptation and mitigation; and research and development needs in support of adaptation. The group proposed to organize one or two targeted workshops regarding decision-support tools for adaptation activities.

Discussion

Several members suggested that assessment of adaptation activities should focus on existing examples, rather than looking for new case studies; the time investment could be considerable, and there are already many great examples. One member noted that we should not only provide examples of adaptation, but also address the time frame for which those activities are designed.

A point of concern was potential lack of coordination with regional/sectoral teams that may already be approaching adaptation and mitigation differently than was proposed by this group. Another concern was the breadth of the proposed scope for the adaptation and mitigation chapter, and the proposed strong focus on adaptation, rather than a balance between the two. The need to start documenting adaptive capacity in sectors and regions was noted. It was suggested that the technical input report should focus more on a long-term NCA strategy on this topic, while the chapter might focus more on case studies.

Approach to International Context
David Hales, College of the Atlantic, NCADAC Member

Summary
Dr. Hales reported that the objective of this group was to consider the importance and the approach to examining the international context for the US National Assessment in the NCA report and in the long-term NCA process. Hales reported that basic guiding principles should include consistency, relevance, and quality control. The proposed approach is to integrate priority topics where appropriate across the assessment teams and to consider including a dedicated international chapter to address issues that would not otherwise be addressed throughout the report. Close cooperation with other Working Groups (including a NCADAC liaison to each) was recommended in order to avoid redundancy in the NCA products. Additionally, this group suggested reviewing submissions from other Working Groups in order to identify and suggest areas in which international perspectives could be addressed.

Discussion
It was suggested that rather than having a dedicated international chapter in the 2013 report, the group consider a stand-alone international-context product as a future NCA product, beyond 2013. One NCADAC member cautioned the Working Group against trying to address the implications of climate change on national security. It was stated that the NCADAC has neither the expertise nor the clearance to undertake such an assessment and has enough other material to address without adding national security to its purview. There were also concerns about ensuring that the integration of international considerations across regional and sectoral sections not be administratively burdensome.

Action: The International Context Working Group agreed to revise its plan, and send to the NCADAC for comments by September 1, 2011. Comments on its proposal are requested to be received by September 15, 2011. The group will then examine pros and cons of a separate international chapter.

Regional Strategy and Status
Gary Yohe, Wesleyan University and NCADAC Vice-Chair
Lynne Carter, Louisiana State University, NCADAC Member
Fred Lipschultz, U.S. Global Change Research Program, NCA Staff

Summary (see PowerPoints)
Issues and topics presented for consideration by the NCADAC by Drs. Yohe, Carter and Lipschultz included:

- coordination of efforts with CEQ/OSTP proposed strategy on regional climate services and adaptation
- regional NCA strategy document
- regional Working Group composition and communication schedule
- regional issues – coordination of components and plans for oceans and marine resources chapters
- integrating inputs from the RFI process
- facilitating wide participation in an evolving process

Major progress was noted in the development of regional teams. Monthly teleconferences are being held with each region, and each region is being supplied with a collaborative workspace to use for document storage and general coordination. Many groups already have plans to bring together teams to discuss how to approach their respective chapters.

Key elements for regional chapters were suggested and included an introduction, evaluation of regional climatologies and projections that are being prepared by Ken Kunkel, planning for the future, and "regional richness" – an identification of unique considerations. The group offered a proposal for addressing the Coastal and Marine chapters of the NCA report, in which the two chapters would be separated based on a set of criteria that include climate change impacts.

Discussion
Comments from NCADAC members focused around the need to incorporate information from non-government sources and how to document that kind of material. Expressions of Interest (EoI) submissions will be shared with regional teams in October (after the deadline) and they will engage as they see fit. Author teams for the 2013 Report will have full access to final RFI submissions, but they will use other sources when necessary. Regional teams are encouraged to use their discretion in covering topics that may overlap because omission is worse than duplication at this point. Coordination will be most essential at the 2013 Report writing stage, and so concern was expressed regarding the need for appropriate leadership of regional writing teams at that point.

Sectoral Strategy and Status
Jim Buizer, Arizona State University, NCADAC Executive Secretariat

Mary Gade, Gade Consulting, NCADAC Member
Ralph Cantral, U.S. Global Change Research Program, NCA Staff
Toral Patel-Weynand, U.S. Forestry Service, INCA Task Force
Robert Vallario, U.S. Department of Energy, INCA Task Force

Summary

Jim Buizer noted significant progress in the development of sectoral teams, using a "franchise" approach that allows technical input teams to do their work independently, but with connections to the NCADAC. Each of the 13 teams has at least one representative from the NCADAC and from the Interagency National Climate Assessment (INCA) Task Force. The Sectoral Working Group has set a September 15, 2011 deadline for technical input teams to provide prospectuses, and will then conduct a gap analysis to identify areas of need. There is a sectoral strategy document and an "aspirational outline" for the sectoral components of the 2013 report. This is not intended to restrict the format of technical input documents but does let people know what topics/information would be helpful for the sectoral chapter author teams. Mr. Buizer requested input on the proposed outline, and then asked for the agency leads of a couple of the sectoral efforts to provide updates on their progress.

Toral Patel-Weynand discussed the successful stakeholder workshop held by the U.S. Forest Service (USFS) in July 2011, the first of the sectoral workshops for this assessment cycle. It was attended by more than 60 people and the participants responded well to the risk-based framing proposal. She requested a short (~2 page) uncertainty-guidance document be provided to the agencies as soon as possible. USFS has identified lead authors for their technical input and they are on target to deliver it by March 1, 2012.

Bob Vallario discussed three sectoral technical input studies undertaken by the Department of Energy (DOE), and noted that they are collaborating with many other agencies and institutions. He noted that the team will maintain a strong focus on infrastructure and urban settings in the Urban Infrastructure and Vulnerability cross-cutting topic, while NOAA's contribution (led by Bill Solecki and Cynthia Rosensweig) will focus more on societal vulnerabilities and environmental justice in the urban context. DOE has held planning workshops on this topic and on Energy-Water-Land, and is focused on meeting the March 1, 2012 deadline. Vallario identified some challenges and potential issues:

- it is difficult to find people with the appropriate expertise across sectors, e.g. there are many people who study energy-water but few who actually work at the intersection of all three (*e.g.*, land/water/energy)
- they need scenarios inputs right away – draft technical inputs need to be submitted to DOE by December for agency review
- they need specific guidance on information quality and standards within 3-4 weeks

Discussion

Concern was expressed regarding comments made earlier in the meeting that certain cross-sectoral efforts previously approved might not be included in the 2013 report. It was clarified

that any cross-sector studies not expressly included in the 2013 report will be addressed in future NCA products. There was general agreement on the need to think strategically about the organization of the chosen cross-sectors in the 2013 report.

There was strong agreement regarding the need for coordination between regional and sectoral teams, though some pointed out that some topical overlap can be good. A key issue will be to address the complexities of findings that differ because they are based on different assumptions. It was noted that both regional and sectoral teams should receive the same technical input documents if they are relevant to both.

Climate Science (Trends and Projections)

Thomas R. Karl, NSTC Subcommittee on Global Change Research, NCADAC Ex Officio Member
Ken Kunkel, NOAA National Climatic Data Center
Donald Wuebbles, University of Illinois, NCADAC Executive Secretariat

Summary

Tom Karl discussed this Working Group's focus on extreme events, giving some recent statistics regarding damage and loss caused by extreme events. He outlined a series of five workshops to be held to explore aspects of extremes. The first was held in July, 2011 and addressed extreme storms. The four remaining workshops will address 1) heat waves, cold waves, floods, and drought; 2) attribution of changes in climate extremes; 3) winds and extra-tropical storms along the coasts; and 4) the results from the Coupled Model Intercomparison Project (CMIP). Results from each of these workshops will be written and submitted for publication in the *Bulletin of the American Meteorological Society* (*BAMS* – a peer-reviewed publication). Karl mentioned that it would be useful if the NCA author teams were identified soon, as they could help frame content and be engaged during the process for these workshops.

Dr. Kunkel discussed the development of regional climatology summaries; they are intended to provide a coherent picture of what has been happening in the regions (general description, major climate factors, and trends) and to provide context for the projections. He provided a status update for the summaries for each region; several are complete and the others are well-underway. Kunkel highlighted the data sets and time periods being used to develop the regional outlooks. He also provided an overview of the outlook products in development by the Working Group.

Discussion

Support for the focus on extreme events was expressed, noting that there is a need to acknowledge longer-term trends as well that may be critical for ecosystems and may also lead to approaching or crossing climate thresholds. There was general agreement that the NCA should focus on decision-maker needs rather than letting only climate scientists determine needs for new research.

Scenarios
Bill Emanuel, U.S. Global Change Research Program, NCA Staff

Summary
Dr. Emanuel explained that scenarios are being developed for analyzing uncertainties and providing a framework for analysis. He stated that scenarios are best developed for specific applications. Four types of scenarios are in development – climate, sea level, land cover/use, and socioeconomic. Additionally, an innovative scenario planning process is being included in pilot studies. Emanuel reported recommendations for each of the scenario types:

- climate – use IPCC SRES A2 and B1 emissions scenarios
- sea level – a workshop report is forthcoming
- land cover/use – no specific recommendations yet
- socioeconomic – characterize historical trends and current conditions using U.S. government data. Long-term (>30 years) projections will be a challenge.

Discussion
It was noted that progress on scenario development has been excellent, though there was general concern about whether all of the information will be available to teams in a timely way.

Perspectives on Engagement
Mark Howden, Commonwealth Scientific and Industrial Research Organisation, NCADAC Member
(This presentation was added to the agenda on an *ad hoc* basis and was not included in the original agenda published online)

Summary
Dr. Howden offered insights from Australia, which has engaged in processes similar to the NCA; though Australia has focused more on mitigation as it relates to carbon tax, than on impacts and adaptation. He advised that working with stakeholders is essential and that engaging as scientists to support on-the-ground action helps align science with public values. He further advised that the link between public and science must be truly participatory; the public must share power in the process. He described *EnergyMark,* which uses social network theory to engage citizens in energy conservation initiatives. Howden cautioned the NCADAC to remember that more information does not equate to better decision making, there is a lot more to consider in translating science for and with stakeholders.

Discussion
Members were very receptive to Dr. Howden's comments, and again emphasized the issue of product *versus* process. The concern was that the current focus is too much on the short-term (2013) product while it should be on the long-term process.

There was more discussion regarding the use of confidence intervals (likely, highly likely, etc.) and the effect they could have on the reliability/trustworthiness of the NCA. Some members felt that this type of terminology must be included, but used carefully and consistently; others felt that these types of statements are too politically charged and should be avoided.

Recap of the Day
(covered on the morning of August 18, 2011)
Jerry Melillo, Marine Biological Laboratory, NCADAC Chair

Dr. Melillo highlighted some actions and important messages from the day's meeting:

- general approval for the risk-based guidance with a need to define a path forward
- general support for uncertainty guidance with request to consider lexicon of likelihood indicators
- agenda for climate change science – leverage existing work; balance natural & social science
- mitigation and adaptation – proposed focus on adaptation; concern about ambitious plan and need to include more mitigation in the agenda
- international context – confirmed approach to integrate international context into regional/sectoral chapters; will revisit need for full international chapter in the future
- regions and sectors – significant progress; need to focus on coordination, communication, and addressing cross-cutting topics
- climate science – support for focus on extremes; suggest consideration of long-term trends
- scenarios – excellent progress; concern regarding timely delivery of information
- timeline – need to consider revisions with OSTP
- chapter author teams should be implemented quickly
- identify benchmarks in process and clear paths forward, considering contingencies

Public Comments

See Appendix B for written versions of the oral comments.

Adjourn
The meeting adjourned for the day at 6:00 pm.

Thursday, August 18, 2011

Indicators

Anthony Janetos, Joint Global Change Research Institute, NCADAC Member

Summary

Dr. Janetos outlined the types of indicators explored so far – ecological, physical, and socioeconomic. He also highlighted key issues for the NCADAC to consider:

- identify intended purpose of indicators
- identify the intended audience
- establish theory of change
- leverage existing work
- engage stakeholders
- determine what is needed in the short- and long-term

Discussion

There was a strong focus (and general agreement) on the need to identify the intended audience and develop appropriate indicators that will adequately serve the needs of that audience.

Long-term Process

Kathy Jacobs, OSTP, NCA Director
Maria Blair, American Cancer Society, NCADAC Member
John Hall, U.S. Department of Defense, NCADAC Ex Officio Member

Summary

Ms. Jacobs stressed the importance of establishing a long-term NCA process rather than over-spending time and resources to start anew every time a NCA is due. The NCADAC was established as a standing federal advisory committee for that purpose. Engagement activities, formation of partnerships with outside organizations, and regional/sectoral coordination will all be critical for maintaining an ongoing process into the future. Ms. Jacobs identified the need to clarify important long-term assignments so people can understand that there is a strong commitment to the ongoing process, and explain how these relate to what is and is not produced in the 2013 report (including the Mississippi watershed, high-elevation areas, the Arctic, etc.).

Dr. Hall discussed the desire for the NCA to address a very ambitious agenda, as well as the realization that it could not all be accomplished by 2013. He acknowledged the tradeoffs between doing work for 2013 and doing work for the future, but reiterated the commitment to establishing a sustainable process. Maria Blair stated her interest in the outcome of the NCA (e.g. useable information and strong engagement) and not just in the report itself. She suggested that equal amounts of time be spent on the process and the product.

Discussion

Several members expressed their desire to spend more time developing the long-term process rather than focusing so strongly on the 2013 report. Some felt that too much information is planned for inclusion in the 2013 product, and that some topics could be addressed in the future

so that more time can be spent on the process now. Ms. Jacobs assured the group that the long-term process has always been a key focus of those involved in the early stages of planning for the NCA. Much time has been dedicated to developing ideas for methodologies, setting a framework for indicators, web deployment, etc.

There was a suggestion to rename the Working Group to make it clear that the group's goal was for the future and would not receive appropriate attention now.

Action: John Hall and Maria Blair were named as leads for the Working Group that will address the post-2013 activities. This group was renamed the Sustained Assessment Process Working Group.

Request for Information (Status and Protocols)
Lindene Patton, Zurich Financial Services, NCADAC Executive Secretariat
Paul Fleming, Seattle Public Utilities, NCADAC Member
Emily Cloyd, U.S. Global Change Research Program, NCA Staff

Summary
The purpose of this group is to manage receipt and tracking of information received in response to the request for information (RFI) published in the *Federal Register*. Ms. Patton reviewed the RFI and noted that a correction is being made to reflect the response deadline of October 1, 2011. She identified a potential issue that may arise if the same data is submitted through the RFI process as well as through another channel (e.g., author team); this could cause a lack of consistency in classification and treatment of the information.

The group reviewed a flow chart detailing the process for submitting an expression of interest (EOI) in response to the RFI. They have established a response and tracking process that will be tended by Emily Cloyd, USGCRP's Public Participation and Engagement Coordinator for the NCA. The process is designed to help maintain consistency within and between chapter author teams.

Discussion
After some confusion, it was clarified that technical input teams working directly with the NCADAC do not need to submit EOIs through the RFI process; they should, however, submit a prospectus of their work.

Serious concern was voiced regarding the long-term and short-term usability of the database, suggesting that it is set up for a single process only and doesn't meet the standards typically required for such databases used by other agencies in the federal government. In response, NCA staff assured the NCADAC that the current spreadsheet was just a beginning to open discussion regarding what is recordable and what is usable, and its design is completely open for discussion and refinement. Further, it is intended as a tracking mechanism to catalog and organize

information as it comes in; in the future, there will be a different system in place for archiving the information.

Further discussion centered on the need for clear criteria regarding how decisions will be made to either include or exclude material from the NCA report. It was suggested that chapter authors should have the right to exercise professional discretion as experts. Another member suggested a model similar to that used by IPCC in which the chapter authors' choice to exclude material could be questioned and they would defend their choices via written response. It was noted that this exact model may not be feasible since the NCA will consider a wider variety of materials than IPCC, but something similar may work.

The NCADAC chair noted the clear need for further discussion on this issue and asked that any members with particular input contact this Working Group and arrange to work with them.

Action: NCADAC members will contact the FRI Working Group with suggestions on how materials will be made available to chapter authors and criteria for inclusion or exclusion of materials.

Engagement, Communication, and Evaluation
Ed Maibach, George Mason University, NCADAC Member

Summary
This Working Group proposed removing the word "education" from its original name and replacing it with "communication", suggesting that education is outside the scope of what the NCA can do given its current resources. Dr. Maibach highlighted the importance of continuing to make efforts to promote the last NCA, as it is still relevant and useful; many stakeholders are not familiar with it. He also asked that NCADAC members alert members of their own professional networks to the RFI, and encourage them to respond.

Dr. Maibach identified the need to enhance stakeholder demand, and suggested that OSTP reach out to engage stakeholders in a large meeting at which they would be briefed on the whole NCA process and be solicited for their input and participation. He also expressed concern about the resources currently available to support the communications and engagement strategy, and suggested that exploring engagement options become one of the NCADAC's highest priorities.

Discussion
There was much discussion surrounding the idea of a large, OSTP-initiated stakeholder meeting. Many words of caution were offered, but overall support for the idea was strong. Several members offered examples of similar meetings that have been quite successful in broadening engagement. There was general agreement that there is a need to further define the engagement and communication strategy as soon as possible because it is essential for a sustainable process.

Quality Assurance and Data Management
T.C. Richmond, GordonDerr, LLC, NCADAC Vice-Chair
Sharon Hays, Computer Sciences Corporation, NCADAC Executive Secretariat
Anne Waple, Program Manager for NOAA's Technical Support Unit to the NCA

Summary
The group outlined their recommendation for their clarified charge, to include

- establish standards/guidelines
- establish quality assurance process
- support USGCRP portal

They clarified that this Working Group is **not** charged with conducting reviews of submitted inputs; that responsibility will fall to the chapter author teams.

In response to their first two charges, they expect to provide written guidelines (as a matrix), quality assurance process (as a decision tree), and frequently asked questions (FAQ). In response to their third charge, this group intends to produce a highly accessible portal: with transparency of data; that is compatible with and supports guidelines and quality assurance review process; and leads to greater utility of the NCA and supplemental material. The group also laid out specific steps and a timeline that they will use to accomplish their initial set of goals.

Discussion
There was some concern regarding how to ensure compliance with the Information Quality Act (IQA), since most members do not work for institutions that are subject to the Act's requirements. This Working Group does have plans for providing guidelines that are understandable and easy to follow so that chapter authors will be comfortable determining compliance. They plan to vet their guidelines with NOAA legal counsel before releasing them.

There was overall agreement on the inclusion of materials and data that are not traditionally peer-reviewed, but still hold great value (e.g., tribal data). The mechanism has not yet been established, but it remains part of the NCADAC's plan.

Web Portal (Progress and Plans)
Anne Waple, Program Manager for NOAA's Technical Support Unit to the NCA

Summary
Dr. Waple described the Global Change Information Portal (GCIP), which is being designed as an answer to the NCA's need for a web-based mechanism for deployment of NCA-related information and for transparency, accessibility, timeliness, and connectivity needs. The GCIP would also serve as a single source of authoritative information for climate and global change. It was noted that the term "portal" may not be the appropriate choice and is open for discussion.

Major components of the NCA's web presence would include content (data, citations, findings, graphics, etc), NCA process information, collaborative sites (e.g. for regional and sectoral teams), and NCADAC meeting details. Recent progress includes development of an interagency team, identification of the initial governance structure, production of a website for the last (2009) NCA report (not yet public), and the development of collaborative portals for regional and sectoral teams. Immediate next steps will include the development of a detailed strategy and implementation plans, deployment of the 2009-NCA website, and deployment of the collaborative portals.

Discussion

The overall concept of the portal was very well received by the NCADAC. They were impressed with the progress made to date and were excited to see more activity on this front. Collaborative portals were also discussed positively. Some members who had already formed technical input teams were excited to start using one of the workspaces right away. A bit of concern was expressed over how to prevent unrestricted uploading of materials to these sites; members were assured that the collaborative portals are password protected and that other materials would continue to be submitted via the RFI process.

Summary of Actions and Next Steps

Jerry Melillo, Marine Biological Laboratory, NCADAC Chair

Dr. Melillo highlighted some major points from the meeting. He noted the ambitious outline for the 2013 report, but believes that the NCADAC is well on its way and will accomplish its task, pointing out that the edits made to the timeline make this more feasible. The expanded timeline also enhances the ability to increase community engagement. The need to identify specific post-2013 products and focus more fully on the ongoing process was also noted.

Dr. Melillo reiterated the need to move forward with an engagement strategy as soon as possible, as it is essential to a sustainable NCA process. He suggested looking outside the government for additional resources, and asked that the NCADAC help the Working Group think through this issue.

In order to enhance engagement and communication and to make more progress in general, Dr. Melillo suggested changing the format of the NCADAC meeting to include more Working Group meetings and shorter plenary meetings. He also suggested more clarity up front about expected outcomes from the meetings, as the NCADAC cannot really afford to spend more time on informational meetings; decisions must be made. These ideas were met with general agreement. Another suggestion was that access to the internet during meetings should be a high priority.

Actions that need to be taken prior to the next NCADAC meeting were outlined:

- approach to likelihood language
- international context chapter now *versus* a larger product later

- approach to adaptation and mitigation chapter
- indicators approach
- naming of chapter authors

The next NCADAC meeting will be held on November 15-17, 2011. The location has not been decided.

Adjourn
The meeting was adjourned at 3:00 pm.

APPENDIX A

ATTENDEES

Non-Federal Members in attendance

Name	Affiliation
Virginia Armbrust	University of Washington
T. M. Bull Bennett	Kiksapa Consulting, Inc. (by phone)
Rosina Bierbaum	University of Michigan (third day)
Maria Blair	American Cancer Society
James Buizer	Arizona State University
Lynne Carter	Louisiana State University
Terry Chapin	University of Alaska
Jan Dell	CH2M Hill
Placido dos Santos	Arizona Dept. of Water Resources (retired)
Paul Fleming	Seattle Public Utilities
Guido Franco	California Energy Commission
Mary Gade	Gade Consulting
Aris Georgakakos	Georgia Institute of Technology
David Gustafson	Monsanto Company
David Hales	College of the Atlantic
Sharon Hays	Computer Sciences Corporation
Mark Howden	Australian Commonwealth Scientific and Industrial Research Organisation
Anthony Janetos	Joint Global Change Research Inst., University of Maryland
Peter Kareiva	The Nature Conservancy
Rattan Lal	Ohio State University
Arthur Lee	Chevron Corporation
Jo-Ann Leong	Hawaii Institute of Marine Biology
Diana Liverman	University of Arizona and Oxford University
Rezaul Mahmood	Western Kentucky University
Edward Maibach	George Mason University
Jerry Melillo	Marine Biological Laboratory
Susanne Moser	Susanne Moser Consulting
Jayantha Obeysekera	South Florida Water Management District
Marie O'Neill	University of Michigan
Lindene Patton	Zurich Financial Services
John Posey	East-West Gateway Council of Governments
Sara Pryor	Indiana University
Terese Richmond	GordonDerr, LLP
Andrew Rosenberg	Conservation International
Richard Schmalensee	Massachusetts Institute of Technology
Gerry Schwartz	HGS Consultants
Joel Smith	Stratus Consulting
Donald Wuebbles	University of Illinois
Gary Yohe	Wesleyan University

(Interim) Ex Officio Members in attendance

Name	Affiliation
Kit Batten	United States Agency for International Development
Virginia Burkett	Department of the Interior
Gary Geernaert	Department of Energy
John Hall	Department of Defense (SERDP)
Alice Hill	Department of Homeland Security
Leonard Hirsch	Smithsonian Institution
William Hohenstein	Department of Agriculture
Patricia Jacobberger-Jellison	National Aeronautics and Space Administration
Thomas Karl	NSTC Subcommittee on Global Change Research
Cathleen Kelly	Council on Environmental Quality
Chester Koblinsky	Department of Commerce
Linda Lawson	Department of Transportation
George Luber	Department of Health and Human Services
Andy Miller	Environmental Protection Agency
Robert O'Connor	National Science Foundation

USGCRP, NOAA, and NCA Staff in attendance

Name	Affiliation
Ralph Cantral	National Climate Assessment Office (NOAA)
Emily Cloyd	National Climate Assessment Office, USGCRP
Cynthia Decker	Department of Commerce, NOAA
Doreen DiCarlo	Department of Commerce, NOAA
Bill Emanuel	USGCRP/DoE
Chelsea Friedman	National Climate Assessment Office, USGCRP (Knauss Fellow-NOAA)
Bryce Golden-Chen	National Climate Assessment Office, USGCRP
Nancy Grimm	USGCRP/NSF
Stephanie Herring	Department of Commerce, NOAA
Katharine Jacobs	National Climate Assessment Office, OSTP
Melissa Kenney	National Climate Assessment Office, USGCRP (AAAS-NOAA)
Ken Kunkel	Department of Commerce, NOAA
Fred Lipschultz	National Climate Assessment Office (NASA), USGCRP
Julie Maldonado	National Climate Assessment Office, USGCRP
Julie Moore	Department of Commerce, NOAA
Sheila O'Brien	National Climate Assessment Office, USGCRP
Brooke Stewart	Department of Commerce, NOAA
Anne Waple	Department of Commerce, NOAA
Kandis Wyatt	Department of Commerce, NOAA

Others in Attendance

Name	Affiliation
Sarah Abdelrahim	NOAA
Tom Armstrong	USGCRP
Susan Aragon-Long	USGS
Julia R. Brown	CLEANTech
Brenda Ekwurzel	Union of Concerned Scientists
Caron Gala-Bijl	American Society of Agronomy/ Crop Science Society of America
John Holdren	OSTP
Cesar Izaurralde	American Society of Agronomy/ Crop Science Society of America
Jack Kaye	NASA
Fabien Laurier	USGCRP
Allison Leidner	NASA
Michael MacCracken	Climate Institute
Meredith Muth	NOAA
Wendy Naus	Lewis-Burke Associates, LLC
Carolyn Olson	USDA
Toral Patel-Weynand	USDA, USFS
Rick Piltz	Climate Science Watch
Alan Roberson	American Water Works Association
Nicholas Sundt	World Wildlife Fund
Bob Vallario	DoE
Margaret Walsh	USDA
Alone White-Newsome	Union of Concerned Scientists

APPENDIX B

Public Comments

Cesar Izaurralde
The American Society of Agronomy (ASA), Crop Science Society of America (CSSA), and Soil Science Society of America (SSSA)

The American Society of Agronomy (ASA), Crop Science Society of America (CSSA), and Soil Science Society of America (SSSA) developed the following position statement on climate change based on a review of current scientific knowledge and understanding.

I. Climate Change and Agriculture
A comprehensive body of scientific evidence indicates beyond reasonable doubt that global climate change is now occurring and that its manifestations threaten the stability of societies as well as that of natural and managed ecosystems. Agricultural activities (i.e., production of food, fiber, and now bioenergy) extend over a third of the global land surface (13.4 billion hectares). Changes in climate, intertwined with climate variability, are already affecting the sustainability of agricultural systems and disrupting production. Agriculture has an important role to play in responding to climate change, both mitigating its causes and adapting to its unavoidable impacts.

II. Key Concerns for Agriculture—Climate Effects on Crops and Soils
There are many concerns about climate change for agricultural production. For example:

- **Higher temperatures and heat waves** will affect the growth and development of crops, influencing yields. The number of days a crop is exposed to temperatures over thresholds for critical growth stages—e.g. flowering, pollination, fruiting, or grain filling – determines the impacts on yield quantity and quality.
- **Changes in the patterns of precipitation alters** water supply for crops. Climate change is expected to alter rainfall regimes in many regions, resulting in longer, more intense floods and droughts. As a result, erosion, water-logging, and periods of desiccation will be detrimental to yields.
- **Increased atmospheric carbon dioxide (CO2)** concentrations may have positive effects on some crops, but the effects are species-dependent. The photosynthesis, growth, and yield of C3 plants such as wheat and rice tend to benefit more from high CO2 than do C4 plants such as maize. Higher CO2 in the air also increases the efficiency of water use by crops.
- **Changes in temperature, precipitation, and CO2 will interact with other environmental stresses**, such as ozone, which tend to reduce crop productivity.
- **Higher soil temperatures** alter nutrient and carbon cycling by modifying the diversity, community structure, and abundance of soil biota.
- **Heavier downpours** will lead to increased soil erosion. In addition increased precipitation will result in water-logging of soils, limiting oxygen supply to crop roots and increasing emissions of nitrous oxide and methane.

- **Soil water retention capacity**, which can mitigate the impacts of intense rainfall and droughts, will be impacted by a decline in soil organic matter because of rising temperatures and land-management changes.
- **Prolonged spells of heat and drought** between rainy periods may cause wilting, desiccation, and soil salinization, which may, when combined, reduces crop yields.
- **Increased temperature and decreased moisture** tend to accelerate the decomposition of organic material in soils, leading to a decline in soil organic carbon stocks and an increase in CO2 emissions to the atmosphere.

III. Mitigation Actions for Agriculture

Agricultural activities account for 10-15% of total global emissions of the three main greenhouse gases – CO2, CH4, and N2O – although estimates vary. While agricultural, forest, and grazing land-management emit greenhouse gases, many opportunities exist to mitigate these emissions and to sequester carbon in the soil and in the biomass of perennial vegetation. The global mitigation potential for agriculture is estimated to range between 5,500 and 6,000 Mt CO2-eq/year with large-scale adoption of best-management practices that reduce GHG emissions and conserve soil.

Measured rates of soil carbon storage with the adoption of sequestering practices range from 100 to 1000 kg/ha/year, depending on climate, soil type, and site-specific management. Increasing soil carbon sequestration will produce additional benefits, enhancing soil fertility, as well as the resilience and adaptability of agriculture systems. Beneficial agronomic practices that contribute to increase organic carbon residue in soil include cover cropping and reducing tillage.

Methods to reduce CH4 emissions from livestock, the primary source of methane in North America, may include: genetic development and changes in feed formulation. Limiting CH4 emissions from rice paddies requires adjustment of cultural practices, including crop, water, and nutrient management. Such practices include optimizing planting dates, fertilization, and irrigation. Some specific agronomic techniques to reduce N2O emissions include: 1) adjusting nitrogen application rates to crop needs; 2) improving the timing and placement of nitrogen additions to the soil; and 3) and benefitting, when possible, from biological N fixation.

IV. Adapting to Climate Change

Adaptation refers to the process of system adjustment to changes in environmental conditions. It includes actions taken in response to actual climate changes and those that prepare for future climate changes, helping to reduce impacts and/or take advantage of benefits. Given the projected direction of climate change, management strategies can be identified that have the potential to achieve productivity goals in a changing environment while simultaneously enhancing environmental quality. The overall aim of the response to climate change is to ensure food security and other essential human enterprises, while protecting ecosystems and their vital services.

Stages of Adaptation:

As climate changes proceed, we highlight three stages of adaptation:

- **Stage 1:** When climate changes are relatively small, many current techniques are available to help farmers adapt. These early-stage adaptations include varying sowing

dates and cultivars, fertilization, and irrigation scheduling; as well as changing to better-adapted alternative crops.

- **Stage 2:** As climate change proceeds, more extensive changes may be needed including the genetic improvement of crops to create greater tolerance to elevated temperatures and drought and improved responsiveness to rising CO2 and the development of new technologies.
- **Stage 3:** In later decades, severe climate changes in agricultural regions may necessitate transformative shifts to entirely different agricultural systems, such as from temperate-zone to subtropical or semiarid-zone forms of agriculture.

Currently Available Agricultural Adaptation Strategies

- **Increasing crop diversity** – including both widening the array of crop varieties and broadening the range of crops – can be an effective way to moderate the effects of weather variability and extreme events associated with climate change.
- **Use of drip irrigation can help to manage limited water supplies** more efficiently as hydrological regimes become more unstable and periods of drought become more severe.
- **Integrated pest management** is a means to help agricultural systems respond to changing pest regimes resulting from climate change.
- **Soil management** such as reduced tillage and residue management can be used to conserve water, reduce erosion, and increase soil productivity.

V. The Role of Simulation Modeling in Understanding Climate Change Impacts, Mitigation, and Adaptation

The coming decades will bring changes not only to our environment, but also mark unprecedented demands for food, fiber, and bioenergy products for a population of nine billion. Anticipating the behavior of food, fiber, and bioenergy production systems under the influences of a changing climate is crucial for the design, evaluation, and deployment of mitigation and adaptation options. Simulation modeling has played an important role toward and understanding of climate change impacts on agriculture. As a result, modeling is shedding light on mitigation options in agriculture that involve soil carbon sequestration and mitigation of GHG. However, much remains to be done in order to develop an integrated modeling framework capable of simulating the sustainable use of land and water resources to satisfy human needs, enhance provision of ecosystem services, and attenuate the anticipated negative impacts of climate change.

The American Society of Agronomy (ASA), Crop Science Society of America (CSSA), and Soil Science Society of America (SSSA) are dedicated to seeking ways to mitigate climate change to the extent possible, and to adapt the practices of agriculture and other land uses to the climate manifestations that cannot be prevented.

Rick Piltz, Climate Science Watch

Public comment statement at National Climate Assessment Development and Advisory Committee meeting
Washington, DC
August 17, 2011

It's great to see the new National Assessment rolling forward with the substantial effort that is being devoted to it. I expect that a very good assessment report will be produced out of this complex process. At this point my greatest concern is with the public communications and stakeholder engagement component of the assessment. In brief:

First: clearly, the resources currently allocated to communications and engagement are completely inadequate for what is needed and for what is described in the engagement strategy. The engagement strategy itself says: Communication efforts that are initiated without sufficient resources can undermine this communication strategy and the overall NCA goals.

The DAC engagement working group raised this issue at the May 20 meeting. Yet there has been no apparent effort to reconcile the commitment to communications and engagement with the resources devoted to those activities.

Second: The NCA process currently lacks the level of transparency needed for effective public and stakeholder engagement. The assessment seems to have no operational definition of 'transparency', or of 'engagement'. These terms are being widely used, but different people seem to have very different ideas about what these terms mean.

My understanding is that there is only 'guidance' summarized by the NCA in its engagement strategy as 'suggested best practices'. And here's what we've seen so far:

- There is no requirement that the coordination office be informed of assessment-related initiatives by agencies or third parties; no requirement that workshops be publicly announced, no requirement that they be accessible in some way to those who were not specifically invited, or even that any of the proceedings be made public afterward.

- Most of the workshops that have been held have not been publicly announced beforehand, and few if any documents (agenda, sponsors, participants, etc.) have been available beforehand.

- The coordination office so far repeatedly has not provided notice of upcoming workshops and has not posted much of the material (or links to the material) that is being generated elsewhere in efforts that are explicitly linked to the NCA.

This raises the question, in terms of Jerry Melillo's presentation yesterday on the assessment structure and information flow: **what is the decision-making structure and what are the responsibilities for information flow specifically in terms of public communication and stakeholder engagement?**

At this point, most stakeholders outside of government and the research community know little if anything about the assessment. Yet it seems to me that the NCA is in a phase of the process when stakeholder engagement is essential, and where the opportunities for engagement should be most abundant via workshops. **Such engagement should be seen as especially important now in terms of shaping the content** of the 2013 assessment report.

In conclusion, a few concrete steps the committee can take to facilitate communications and engagement efforts during the regional and sectoral workshop phase:

- Report to the SGCR and the Interagency NCA Task Force on the implications of the shortfall in available resources for communications and engagement, and on needs for addressing it.
- Define criteria for 'transparency' and for public and stakeholder 'engagement' in the context of the regional and sectoral workshops (i.e. criteria that can be used to establish and maintain transparency and engagement, and to determine the extent to which transparency and engagement have been achieved).
- For all workshops organized or funded in part by federal agencies, the committee should request that the INCA Task Force and SGCR ensure that federal agencies meet the transparency and engagement criteria.
- Call for at least one public regional workshop be held in each region prior to March 2012.
- Require that the NCA website provide basic information on workshops and other NCA-related events.

And finally:

- Initiate and maintain an ongoing dialogue with NGOs on needs and opportunities for supporting communications and engagement.

Also, high-level support from the White House could be especially helpful. The White House could reach out to major stakeholder groups – private sector, nonprofit NGOs, professional societies – convene a meeting at which the White House, including some words from the President, underscores the importance of the National Climate Assessment process and solicits their ongoing involvement.

Caron Gala Bijl, Crop Science Society of America

Crop Science Society of America's
Crop Adaptation to Climate Change Position Statement

Throughout history, farmers have adopted new crop varieties and adjusted their practices in accordance with changes in the environment. But as global temperature continues to rise, the pace of environmental change will likely be unprecedented. More frequent and intense precipitation events, elevated temperatures, drought, and other types of damaging weather are all expected to impact crop yield and quality (Hatfield et al., 2011), making the challenge of feeding an estimated 9 billion people by 2050 exceedingly difficult. Extreme weather events are already affecting agricultural systems around the world. Unpredictable and severe weather can also leave the most volatile regions of the world even more vulnerable to instability due to greater hunger, poverty, and food insecurity (CNA, 2007). Thus, learning to adapt our food production systems to a rapidly changing climate is critical to ensuring security of the global food supply and political stability.

Policy Statement
Climate change has far reaching implications for food security, health and safety, and approaches are required for adapting to new climates. Impacts of climate change are becoming evident and there is no indication that these will reverse in the foreseeable future; action must be taken now to adapt in a timely manner and prevent unpredictable and undesirable outcomes. New crop varieties, cropping systems, and agricultural management strategies are needed to provide options to farmers to counterweight these changes.

The Crop Science Society of America's (CSSA) position statement—Crop Adaptation to Climate Change—was researched and assembled by a working group of scientists from academia and industry. The statement 1) reviews the impacts of variable weather conditions arising from climate change on cropping systems, 2) reports the progress to date in adapting crops and management practices to new conditions, and 3) offers focus areas for increasing the speed at which global agricultural systems can adapt to climate change.

This CSSA Position Statement identifies the challenges that crop science can address to adapt cropping systems to climate change in the short-term. However, uncertainties and limited predictability in the long-term require an infrastructure that drives innovation and implements crop adaptation strategies in a sustainable manner. In particular, research investments and efforts are needed to further:
• understand the physiological, genetic, and molecular basis of adaptation to drought, heat and biotic stresses likely resulting from climate change;

• translate new knowledge into new agricultural systems that integrate genetic and management technologies (i.e., both breeding and agronomy will contribute to adaptation); and
• transfer knowledge effectively and make technologies and innovations widely available to increase food production and stability.

The CSSA recognizes that both private and public sector research and development are fundamental to building a sustainable approach to crop adaptation to climate change. Collaboration and communication between these sectors is also essential to create knowledge, and develop and transfer new technologies. Although the contributions of government, universities, and industry may vary with crop, region, and time, the roles of each can be tailored appropriately.

Both private and public sector research is vital to improving crops and production systems. However, the land-grant university system plays another critical role: It trains the next generation of crop scientists, agronomists, breeders, and growers. Without these human resources, society will have little or no capacity to adapt to climate change.

In summary, the Crop Science Society of America finds that an effective, planned response to climate change must include provisions for significant investments in and strengthening of crop science research that provides knowledge and information on adapting crops and cropping systems to our changing environment.